

Lab: *Properties of Water*

Name: _____ Date: _____

1. Define the following: (focus on how these terms apply to water)

Polar molecule –

Hydrogen bonding –

cohesion –

adhesion -

surface tension-

density -

Specific Heat –

Solute –

Solvent -

Activity #1: Pile it On

Materials: 2 DRY pennies, 1 eye dropper of water, 1 eye dropper of kerosene.

Procedure: Before you do anything, make a guess about the number of drops of water that will sit on top of a penny. Then guess the number of drops of kerosene that will sit on a penny.

After you have made a prediction, place two clean, dry pennies on a piece of white paper. Slowly place drops of water on one of the pennies. Counting the drops that you put on until the paper beneath the penny shows signs of wetness. Once the paper is even the slightest bit wet, stop adding drops and record the number.

Repeat the experiment with drops of kerosene.

	Water	Kerosene
<i>Prediction: How many drops do you THINK will sit on the penny without spilling?</i>		
<i>Data: How many drops ACTUALLY sat on the penny without spilling?</i>		

2. What properties of water allow the water droplets to pile up on the penny? Explain your answer.

Activity #2 The Floating Ice Cube

Materials: ice cube, container with water, container with Kerosene.

Procedure: Place the ice cube in the container of water. Does it float or sink? Observe. Take the ice cube out of the water and place it in the container of kerosene. Does it float or sink? When you have completed your observations, pour the kerosene into another container and put the ice cube in the sink.

<i>What did you see when the ice cube was in the water?</i>	<i>What did you see when the ice cube was in the kerosene?</i>

3. What does it mean to float? Explain floating in terms of density.
4. Rank the density of water, ice and kerosene. Which is the densest? Which is the least dense?

Activity #3 The Floating Paper Clip

Materials: paper clip, container with water, Kerosene.

Procedure: Using a steady hand, see if you can get the paper clip to rest on the surface of the water in such a way that it will not sink. After you succeed, carefully add a drop of liquid soap to the container far from the paper clip. Observe what happens.

Now try to get a paper clip to rest on the surface of the kerosene.

Could you get the paper clip to rest on the surface of the water? _____

What did you observe when the soap was added to the water with the paper clip?

Could you get the paper clip to rest on the surface of the kerosene? _____

5. The density of a paper clip is much higher than the density of water, so it should not float on the water. What property of water allows a paper clip to rest on its surface?

6. Which liquid has the higher surface tension, kerosene or water? Explain your answer.

7. What effect does soap have on the surface tension of the water? Explain your answer.

Activity #4 Polarity: Is it attractive?

Materials: 3 Burets, one with water, one with Kerosene, one with alcohol.

Procedure: Charge up the plastic rod by rubbing it with the cloth. Open the valve on the buret filled with water and place the rod near to the stream of water. Record your observations.

Repeat the experiment using the buret of kerosene and the buret of alcohol.

	<i>Observations</i>
<i>When the rod was near the water...</i>	
<i>When the rod was near the kerosene...</i>	
<i>When the rod was near the alcohol...</i>	

8. Which of the liquids is likely to be polar? Explain your answer.

Activity #5 Polarity: The Magnets

Materials: iron bar, magnets, aluminum bars

Procedure: Spread the magnets out on top of a piece of paper. Do the magnets tend to stay apart or hold together? What happens when you bring the iron rod near the magnets?

Clear the magnets off the paper and repeat the experiment with the aluminum bars.

	<i>Magnets</i>	<i>Aluminum bars</i>
<i>Do the particles attract each other?</i>		
<i>Are the particles attracted to the iron bar?</i>		

9. Do the magnets represent polar or non-polar molecules? _____

10. Do the aluminum bars represent polar or non-polar molecules? _____

11. Which of the liquids used in this lab is most like the magnets? Which of the liquids used in this lab is most like the aluminum bars?

Activity #6 The Super Solvent I

Materials: Water, sugar, salt, vegetable oil,

Because of its high polarity, water is called the universal solvent. A solvent is a substance that dissolves, or breaks apart, another substance (known as a solute). A general rule that determines whether a substance will dissolve in a solvent depends upon its polarity. Polar solvents dissolve polar solutes and nonpolar solvents dissolve nonpolar solutes.

Procedure: Fill each of the “water” test tubes (#1-4) with about 3 cm of water. Then place a chunk of the sugar into test tube #1. Place a similar amount of salt into test tube #2. In test tube #3 put a similar amount of vegetable oil, and in test tube #4 put a similar amount of karo syrup.

Cover each test tube with a cork and shake it up. Allow the test tubes to settle for a minute or so, and then record your observations.

<i>Solute/Solvent</i>	<i>Water</i>
<i>Sugar (???)</i>	<i>TT#1</i>
<i>Salt (polar substance)</i>	<i>TT#2</i>
<i>Vegetable oil (non-polar substance)</i>	<i>TT#3</i>
<i>Karo Syrup (polar substance)</i>	<i>TT#4</i>

You should record that the solid **“mostly dissolved”, “kind of dissolved”, or “did not dissolve”**.

After you have taken all of your observations, wash the test tubes in the soapy water, rinse them out in the rinse bucket and return them to the test tube holders.

Activity #7 The Super Solvent II

Materials: Alcohol, sugar, salt, vegetable oil,

Procedure: Fill each of the “alcohol” test tubes (#5-8) with about 3 cm of alcohol. Then place a chunk of the sugar into test tube #5. Place a similar amount of salt into test tube #6. In test tube #7 put a similar amount of vegetable oil, and in test tube #8 put a similar amount of karo syrup.

Cover each test tube with a cork and shake it up. Allow the test tubes to settle for a minute or so, and then record your observations.

<i>Solute/Solvent</i>	<i>Alcohol</i>
<i>Sugar (???)</i>	<i>TT#5</i>
<i>Salt (polar substance)</i>	<i>TT#6</i>
<i>Vegetable oil (non-polar substance)</i>	<i>TT#7</i>
<i>Karo Syrup (polar substance)</i>	<i>TT#8</i>

You should record that the solid **“mostly dissolved”, “kind of dissolved”, or “did not dissolve”**.

After you have taken all of your observations, wash the test tubes in the soapy water, rinse them out in the rinse bucket and return them to the test tube holders.

Activity #8 The Super Solvent III

Materials: Kerosene, sugar, salt, vegetable oil,

Procedure: Fill each of the “kerosene” test tubes (#9-12) with about 3 cm of kerosene. Then place a chunk of the sugar into test tube #9. Place a similar amount of salt into test tube #10. In test tube #11 put a similar amount of vegetable oil, and in test tube #12 put a similar amount of karo syrup.

Cover each test tube with a cork and shake it up. Allow the test tubes to settle for a minute or so, and then record your observations.

<i>Solute/Solvent</i>	<i>Kerosene</i>
<i>Sugar (???)</i>	<i>TT#9</i>
<i>Salt (polar substance)</i>	<i>TT#10</i>
<i>Vegetable oil (non-polar substance)</i>	<i>TT#11</i>
<i>Karo Syrup (polar substance)</i>	<i>TT#12</i>

You should record that the solid **“mostly dissolved”, “kind of dissolved”, or “did not dissolve”**.

After you have taken all of your observations, wash the test tubes in the soapy water, rinse them out in the rinse bucket and return them to the test tube holders.

12. Which solvent dissolved the most substances?

13. What gives water the ability to dissolve things?

14. What general rule determines whether a solute will dissolve in a solvent?

15. From this experiment would you conclude that sugar is polar or nonpolar? Explain.

Conclusion:

Explain at least three things that you learned about the properties of water that you did not know before this lab. Show how your data backs up what you learned.